Section 4. Longitudinal Separation

6-4-1. APPLICATION

Separate aircraft longitudinally by requiring them to do one of the following, as appropriate:

a. Depart at a specified time.

b. Arrive at a fix at a specified time.

PHRASEOLOGY-
CROSS (fix) AT OR BEFORE (time).

CROSS (fix) AT OR AFTER (time).

c. Hold at a fix until a specified time.

d. Change altitude at a specified time or fix.

REFERENCE-
FAAO 7110.65, Altitude Information, Para 4-5-7.

6-4-2. MINIMA ON SAME, CONVERGING, OR CROSSING COURSES

Separate aircraft on the same, converging, or crossing courses by an interval expressed in time or distance, using the following minima:

a. When the leading aircraft maintains a speed at least 44 knots faster than the following aircraft - *5 miles* between DME equipped aircraft; RNAV equipped aircraft using LTD; and between DME and LTD aircraft provided the DME aircraft is either 10,000 feet or below or outside of 10 miles from the DME NAVAID, or *3 minutes* between other aircraft if, in either case, one of the following conditions is met:

1. A departing aircraft follows a preceding aircraft which has taken off from the same or adjacent airport. (See FIG 6-4-1.)

Minima on Same Course
44 Knots or More Separation

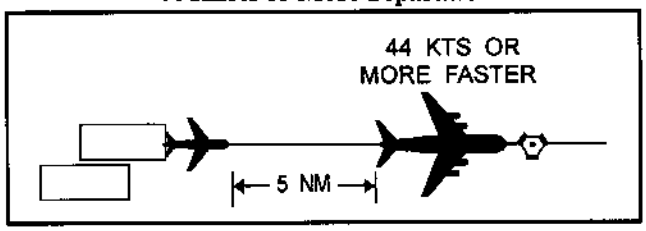

FIG 6-4-1

2. A departing aircraft follows a preceding en route aircraft which has reported over a fix serving the departure airport. (See FIG 6-4-2.)

Minima on Converging Courses
44 Knots or More Separation

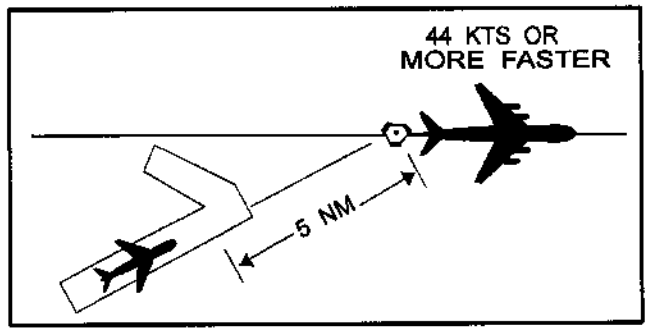

FIG 6-4-2

3. An en route aircraft follows a preceding en route aircraft which has reported over the same fix. (See FIG 6-4-3.)

Minima on Crossing Courses
44 Knots or More Separation

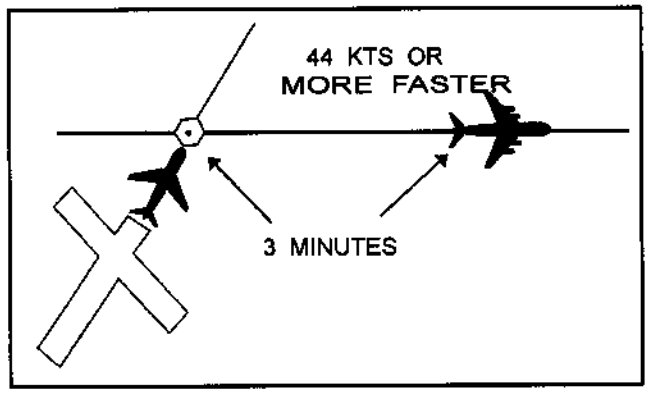

FIG 6-4-3

b. When the leading aircraft maintains a speed at least 22 knots faster than the following aircraft - *10 miles* between DME equipped aircraft; RNAV equipped aircraft using LTD; and between DME and LTD aircraft provided the DME aircraft is either 10,000 feet or below or outside of 10 miles from the DME NAVAID; or *5 minutes* between other aircraft if, in either case, one of the following conditions exists:

1. A departing aircraft follows a preceding aircraft which has taken off from the same or an adjacent airport. (See FIG 6-4-4.)

Minima on Same Course
22 Knots or More Separation

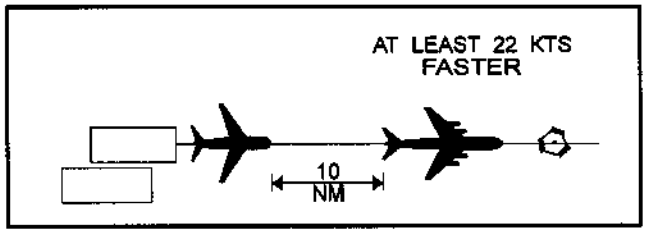

FIG 6-4-4

2. A departing aircraft follows a preceding en route aircraft which has reported over a fix serving the departure airport. (See FIG 6-4-5.)

Minima on Converging Courses
22 Knots or More Separation

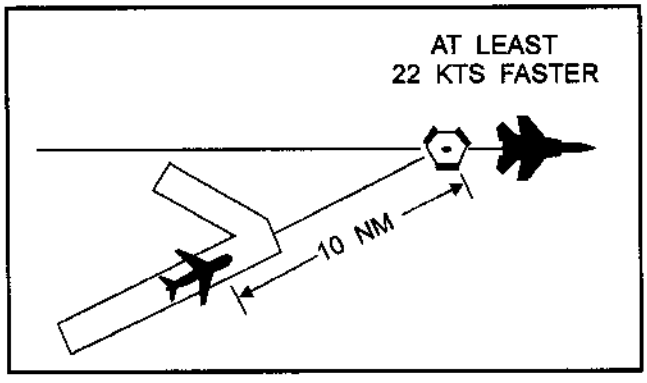

FIG 6-4-5

3. An en route aircraft follows a preceding en route aircraft which has reported over the same fix. (See FIG 6-4-6.)

Minima on Crossing Courses
22 Knots or More Separation

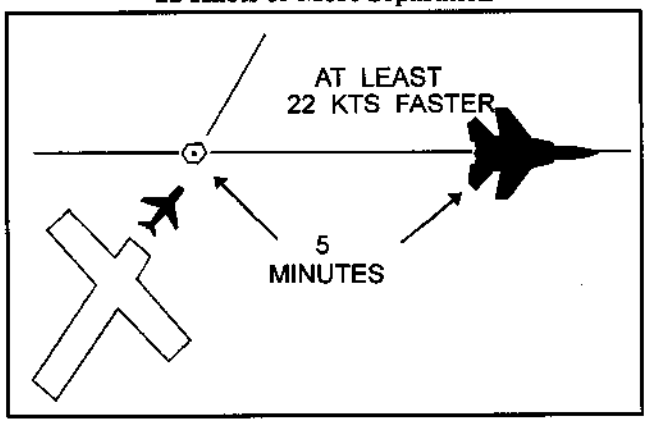

FIG 6-4-6

c. When an aircraft is climbing or descending through the altitude of another aircraft:

1. Between DME equipped aircraft; RNAV equipped aircraft using LTD; and between DME and LTD aircraft provided the DME aircraft is either 10,000 feet or below or outside of 10 miles from the DME NAVAID- *10 miles,* if the descending aircraft is leading or the climbing aircraft is following.
(See FIG 6-4-7 and FIG 6-4-8.)

Descending Through Another Aircraft's Altitude
DME Separation

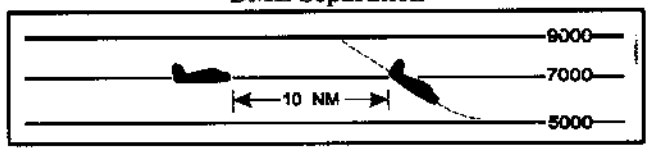

FIG 6-4-7

Climbing Through Another Aircraft's Altitude
DME Separation

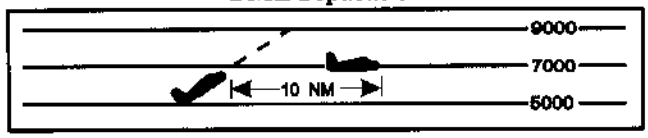

FIG 6-4-8

2. Between other aircraft- *5 minutes*, if all of the following conditions are met:
(See FIG 6-4-9 and FIG 6-4-10.)

(a) The descending aircraft is leading or climbing aircraft is following.

(b) The aircraft are separated by not more than 4,000 feet when the altitude change started.

(c) The change is started within 10 minutes after a following aircraft reports over a fix reported over by the leading aircraft or has acknowledged a clearance specifying the time to cross the same fix.

3. Between RNAV aircraft that are operating along an RNAV route that is eight miles or less in width- *10 miles* provided the following conditions are met:

(a) The descending aircraft is leading or the climbing aircraft is following.

(b) The aircraft were separated by not more than 4,000 feet when the altitude change started.

Descending Through Another Aircraft's Altitude Timed Separation

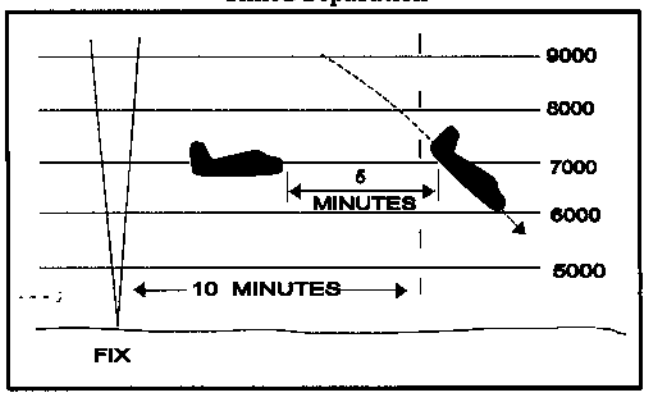

FIG 6-4-9

Climbing Through Another Aircraft's Altitude Timed Separation

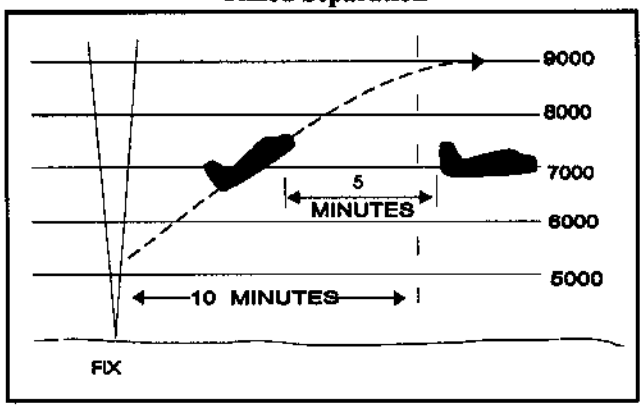

FIG 6-4-10

d. When the conditions of subparas a, b, or c cannot be met- *20 miles* between DME equipped aircraft; RNAV equipped aircraft using LTD; and between DME and LTD aircraft provided the DME aircraft is either 10,000 feet or below or outside of 10 miles from the DME NAVAID; or *10 minutes* between other aircraft.
(See FIG 6-4-11, FIG 6-4-12, FIG 6-4-13, FIG 6-4-14, FIG 6-4-15, and FIG 6-4-16.)

Minima for Same Course Separation

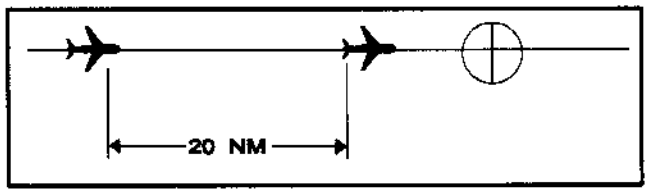

FIG 6-4-11

Minima for Crossing Courses Separation

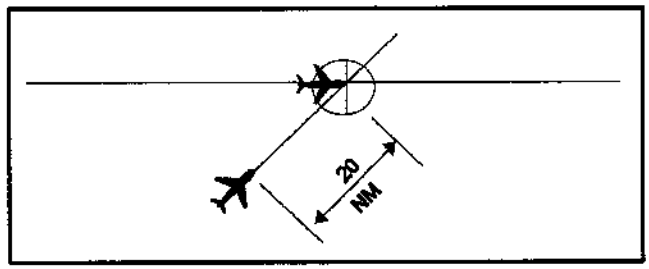

FIG 6-4-12

Minima for Same Course Separation

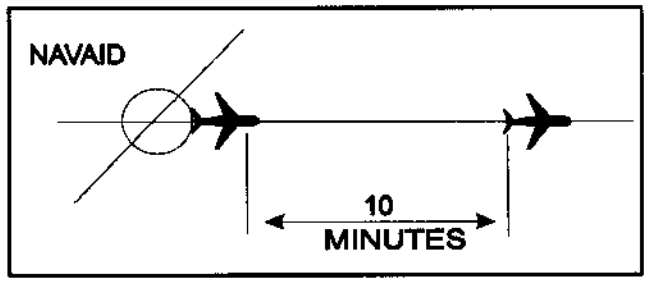

FIG 6-4-13

Minima for Crossing Courses Separation

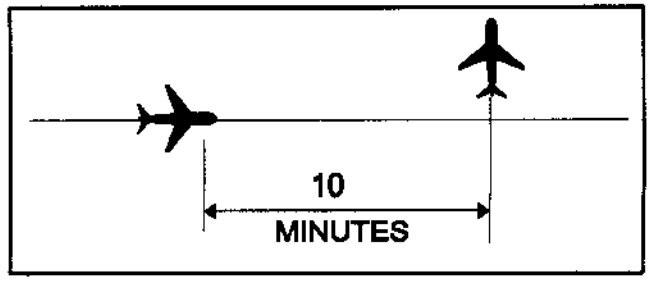

FIG 6-4-14

Climbing Through Another Aircraft's Altitude Separation

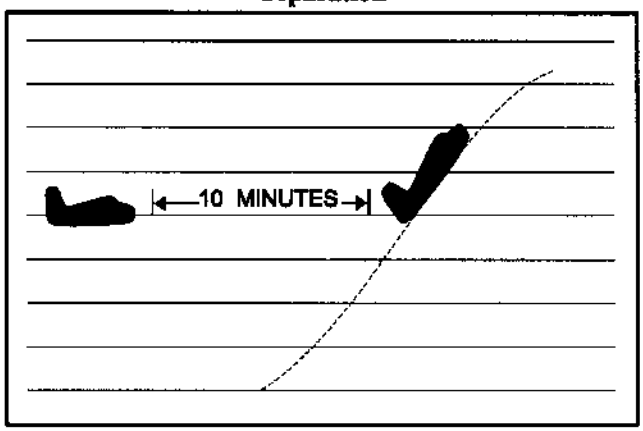

FIG 6-4-15

Descending Through Another Aircraft's Altitude Separation

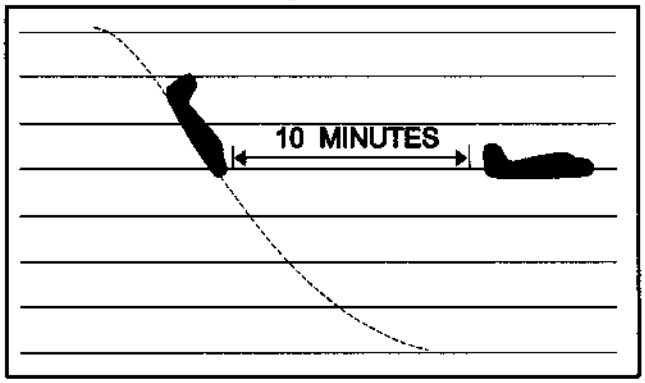

FIG 6-4-16

e. Between aircraft, when one aircraft is using DME/LTD and the other is not- *30 miles* if both the following conditions are met:
(See FIG 6-4-17 and FIG 6-4-18.)

Minima for Same Course Separation

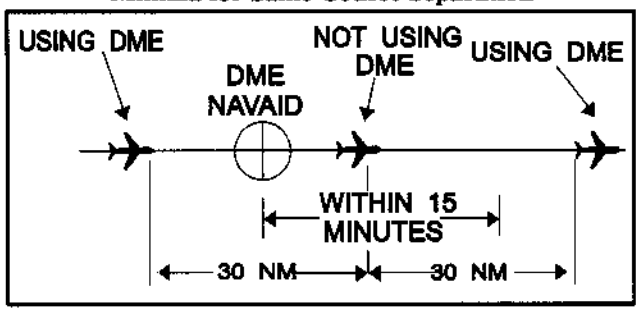

FIG 6-4-17

Minima for Crossing Courses Separation

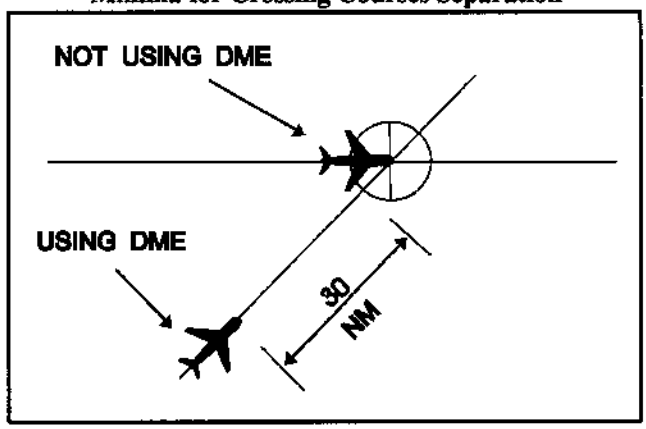

FIG 6-4-18

1. The aircraft using DME/LTD derives distance information by reference to the same NAVAID or waypoint over which the aircraft not using DME/LTD has reported.

2. The aircraft not using DME/LTD is within 15 minutes of the NAVAID.

6-4-3. MINIMA ON OPPOSITE COURSES

Separate aircraft traveling opposite courses by assigning different altitudes consistent with the approved vertical separation from *10 minutes* before, until *10 minutes* after they are estimated to pass. Vertical separation may be discontinued after one of the following conditions is met: (See FIG 6-4-19.)

Minima for Opposite Courses Separation

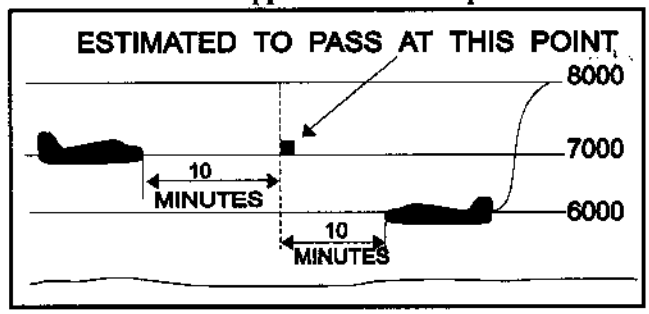

FIG 6-4-19

NOTE-
RNAV route segments that have been expanded in the proximity to reference facilities for slant-range effect are not to be considered "expanded" for purposes of applying separation criteria in this paragraph.

a. Both aircraft have reported passing NAVAID's, DME fixes, or waypoints indicating they have passed each other. (See FIG 6-4-20.)

Minima for Opposite Courses Separation

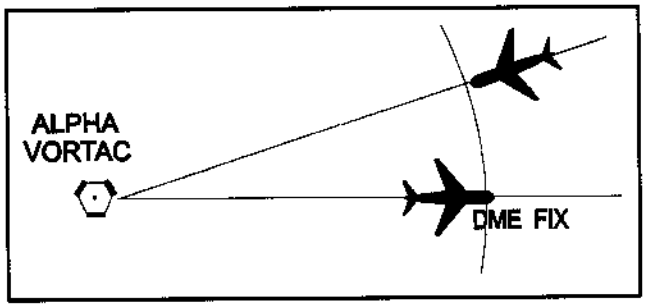

FIG 6-4-20

NOTE-
It is not intended to limit application of this procedure only to aircraft operating in opposite directions along the same airway or radial. This procedure may also be applied to aircraft established on diverging airways or radials of the same NAVAID.

b. Both aircraft have reported passing the same intersection/waypoint and they are at least *3 minutes* apart.

c. Two RNAV aircraft have reported passing the same position and are at least *8 miles* apart if operating along a route that is 8 miles or less in width; or *18 miles* apart if operating along an expanded route; except that *30 miles* shall be applied if operating along that portion of any route segment defined by a navigation station requiring extended usable distance limitations beyond 130 miles.

d. An aircraft utilizing RNAV and an aircraft utilizing VOR have reported passing the same position and the RNAV aircraft is at least *4 miles* beyond the reported position when operating along a route that is 8 miles or less in width; *9 miles* beyond the point when operating along an expanded route; except that *15 miles* shall be applied if operating along that portion of any route segment defined by a navigation station requiring extended usable distance limitation beyond 130 miles; or *3 minutes* apart whichever is greater.

6-4-4. SEPARATION BY PILOTS

When pilots of aircraft on the same course in direct radio communication with each other concur, you may authorize the following aircraft to maintain longitudinal separation of *10 minutes;* or *20 miles* between DME equipped aircraft; RNAV equipped aircraft using LTD; and between DME and LTD aircraft provided the DME aircraft is either 10,000 feet or below or outside of 10 miles from the DME NAVAID.

PHRASEOLOGY-
MAINTAIN AT LEAST ONE ZERO MINUTES/TWO ZERO MILES SEPARATION FROM (ident).

6-4-5. RNAV AIRCRAFT ALONG VOR AIRWAYS/ROUTES

Advise the pilot to use DME distances when applying DME separation to an RNAV aircraft operating along VOR airways/routes.

PHRASEOLOGY-
USE DME DISTANCES.

NOTE-
Along Track Distance derived from area navigation devices having slant-range correction will not coincide with the direct DME readout.